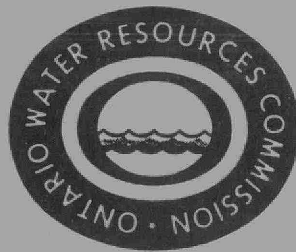


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THE
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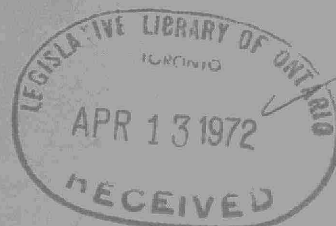
WATER POLLUTION SURVEY

of the

VILLAGE OF MORRISBURG

COUNTY OF DUNDAS

1972



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THE
ONTARIO WATER RESOURCES
COMMISSION
Report On A
WATER POLLUTION SURVEY
Of The
VILLAGE OF MORRISBURG
In The
COUNTY OF DUNDAS

DISTRICT ENGINEERS BRANCH
DIVISION OF SANITARY ENGINEERING
1972

WATER POLLUTION SURVEY

Of The

VILLAGE OF MORRISBURG

INDEX

PAGE NUMBER

INTRODUCTION	1
VILLAGE OF MORRISBURG	1
Location	1
Population	1
Water Supply	2
Sewage Disposal	2
Drainage	3
SAMPLING PROCEDURES	4
SAMPLE RESULTS	4
SUMMARY	5
RECOMMENDATIONS	6

APPENDICES

1	- Bacteriological Indicator Organisms
11	- Significance of Chemical Analyses
111	- Water Pollution Survey - Sample Results
1V	- Bathing Area - Bacteriological Sample Results
Map of Morrisburg	

WATER POLLUTION SURVEY

Of The

VILLAGE OF MORRISBURG

INTRODUCTION

On August 12, 1971 a water pollution survey was conducted at the Village of Morrisburg. Surveys of this nature are performed by the Ontario Water Resources Commission routinely and upon request for the purpose of locating and recording sources of existing and potential water pollution. When significant sources of pollution are found to exist, recommendations for their correction are made to the appropriate authorities.

The assistance provided during the course of this survey by Mr. C. A. VanAllen, Village Superintendent, is greatly acknowledged.

VILLAGE OF MORRISBURG

Location

The Village of Morrisburg is located on the St. Lawrence River in the south-central part of Dundas County. Relocation of portions of the village during the construction of the St. Lawrence Seaway permitted the formation of new residential, commercial and industrial areas. This has permitted the development of an orderly planning and zoning program.

Population

On a population basis Morrisburg is the largest incorporated village in the United Counties of Stormont, Dundas and Glengarry having 2.14 percent (1969 data) of the total population. The populations for Morrisburg from 1965 to 1970 recorded by the

Department of Municipal Affairs were as follows:

1965 - 2205

1966 - 1978

1967 - 1938

1968 - 1940

1969 - 2007

1970 - 1972

Water Supply

The municipal water works at Morrisburg has a combined pumping capacity of approximately 2.2 MGD. Water is taken from the St. Lawrence River and is provided coarse screening and chlorination treatment prior to discharge to the distribution system. Storage is provided in a 208,000 gallon steel tank. The average daily water consumption approximates 335,000 gallons which corresponds to a per capita consumption of 169 gallons per person per day.

Sewage Disposal

The sewage wastes from the village are directed to a primary sewage treatment plant which has a design capacity for 0.5 MGD. The effluent from the treatment plant then passes through a 10.5 acre waste stabilization pond prior to discharge to the St. Lawrence River. When sewage flows exceed the capacity of the sewage treatment plant, the bypassed flows are directed to the waste stabilization pond. Average daily flows in recent years have exceeded the design capacity of the treatment plant. On the basis of population and water consumption, it is evident that an excessive amount of infiltration and storm water runoff continues to gain access to the sanitary sewer system. Recommendations have been directed to the municipality requesting that a program be initiated

to locate and eliminate infiltration and storm water discharges into the sanitary sewers.

Drainage

Drainage from the municipality is directed primarily to the St. Lawrence River via a system of storm sewers and open ditches. Most of the runoff from the built-up portion of the village south of Highway No. 2 is directed to three main outfall sewers, opposite Five Mile Road, opposite Farlinger Street and opposite Laurier Avenue. There had been no recent precipitation and dry weather flows were experienced at the time of the survey. A map illustrating the locations of the storm sewer outfalls has been appended to this report.

Observations at the time of investigation failed to show significant flows in most of the drainage system. The water in the storm sewers opposite Farlinger Street and Five Mile Road was attributed to the submerged nature of the outfalls. These sewers were checked at manholes in the park area upstream from the outfalls. The most significant flow was observed in the ditch which leads to the storm sewer opposite Laurier Avenue. It was believed that this flow was the result of a cooling water discharge from a local industry. There was no visual evidence of sewage waste discharges from any of the storm sewers. Mr. VanAllen reported that many storm and sanitary sewers were constructed side by side with common manholes equipped with overflow arrangements. However, it was indicated that overflow weirs had been suitably raised to prevent any unnecessary bypassing of sewage into the storm sewers.

SAMPLING PROCEDURES

Samples were collected at three points in the storm sewer system and from the waste stabilization pond outfall for bacteriological examinations and chemical analyses. A summary of the results of these samples is included as Appendix IV to this report. The results of bacteriological samples collected from the bathing area by staff of the St. Lawrence and Ottawa Valleys Health Unit for the years 1969, 1970, and 1971, have been summarized in Appendix III.

SAMPLE RESULTS

An outline describing the meaning of various bacteriological indicator organisms has been included as Appendix I to the report. A discussion of the significance of chemical analyses has also been appended (Appendix II).

The results of samples collected from the storm drainage system did not indicate unusual levels of contamination. Although the bacteriological levels were above those acceptable for recreational waters, they could be considered normal for storm sewer discharges. The high ratio of streptococcus organisms to fecal coliform organisms in the Farlinger Street and Five Mile Road sewers suggests the presence of animal wastes. The Biochemical Oxygen Demand (BOD), suspended solids, anionic detergents and phenols concentrations were within normal levels for storm sewer discharges. The reason for the unusually high Total Kjeldahl as Nitrogen concentration in the Five Mile Road sewer is not readily known.

The results of bacteriological samples collected at the Morrisburg beach during 1969, 1970 and 1971 were within the OWRC criteria for recreational waters. There was evidence of deterioration of the bacteriological quality of the water at the bathing area in August 1970; however, this condition did not continue during the 1971 season.

SUMMARY

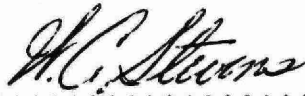
A water pollution survey was performed at the Village of Morrisburg on August 12, 1971. Observations at the time of the survey and the results of samples collected failed to show evidence of significant pollution in the storm sewer discharges. The general satisfactory water quality at the Morrisburg beach further reflected the absence of stream pollution at Morrisburg.

The operation of the municipal water and sewage works has generally been good. Some problems exist with regards to high flows in the sanitary sewers as a result of infiltration and storm water discharges. When flows exceed the design capacity (0.5 MGD) of the sewage treatment plant they are bypassed to the waste stabilization pond. This procedure is good since the waste stabilization pond will provide a degree of treatment not otherwise available to storm water which contains varying amounts of contaminants. However, it is foreseeable that, if unchecked, flows in the sanitary sewers could reach proportions which would result in surcharging in the sewers and the possible bypassing of sanitary sewage into the storm sewers at the previously mentioned combined manholes. On this basis, it is important that the municipality pursue a program to prevent hydraulic overloading of the sewage works.

RECOMMENDATIONS

The Village of Morrisburg should continue to protect the quality of surface water at the municipality. The initiation of a program, to prevent hydraulic overloading of the sewage works by infiltration and storm water discharges into the sanitary sewers, should be a major consideration.

REPORT PREPARED BY:



.....
W. C. Stevens,
Technician,
Div. of Sanitary Engineering.

WCS/lc

APPENDIX 1

BACTERIOLOGICAL INDICATOR ORGANISMS

TOTAL COLIFORM organisms include a wide variety of bacteria ranging from the genus (group) Escherichia Coli (E. coli), which originates mainly in the intestines of man and other warm blooded animals, to the genera Citrobacter and Enterobacter aerogenes. The latter genera are basically found in soil but are also present in feces in small numbers. The presence of total coliforms in water may indicate soil run-off, or more important, less recent fecal pollution since organisms of the Enterobacter - Citrobacter groups tend to survive longer in water than do members of the Escherichia Coli group, and even to multiply when suitable environmental conditions exist.

The FECAL COLIFORM organisms are those coliform bacteria which are of intestinal origin and, therefore, are an indicator of recent fecal pollution. Most of the coliform bacteria found by the fecal coliform test are of the genus Escherichia Coli.

FECAL STREPTOCOCCI organisms are normal inhabitants of the large intestine of man and animals and generally do not multiply outside the human body. In waters polluted with fecal material fecal streptococci are usually found along with fecal coliform bacteria but in smaller numbers. When the number of fecal streptococci bacteria approximates or is greater than the number of fecal coliform organisms, animals are the probable source.

The OWRC Guidelines and Criteria for Water Quality Management in Ontario (1970) indicate that water used for total body contact recreation can be considered impaired when the total coliform, fecal coliform, and/or fecal streptococcus geometric mean density exceeds 1000, 100, and/or 20 per 100 ml, respectively.

NOTE: The term "geometric mean" refers to a type of average. Mathematically speaking, the geometric mean of a set of N numbers is the Nth root of the product of the numbers; in practice, it is computed by the use of logarithms.

APPENDIX 11

SIGNIFICANCE OF CHEMICAL ANALYSES

BIOCHEMICAL OXYGEN DEMAND (BOD)

Biochemical Oxygen Demand is reported in parts per million (PPM) and is an indication of the amount of oxygen required for the stabilization of decomposable organic or chemical matter in water. The completion of the laboratory test required five days, under the controlled incubation temperature of 20° Centigrade.

The OWRC objective for surface water quality is an upper limit of four (4) ppm.

SOLIDS

The value of solids, expressed in parts per million, is the sum of the values for the suspended and the dissolved matter in the water. The concentration of suspended solids is generally the most significant of the solids analyses with regard to surface water quality. The effects of suspended solids in water are reflected in difficulties associated with water purification, decomposition in streams and injury to the habitat of fish.

NITROGEN

Ammonia Nitrogen or sometimes called free ammonia is the insoluble product in the decomposition of nitrogenous organic matter. It is also formed when nitrates and nitrites are reduced to ammonia either biologically or chemically. Some small amounts of ammonia, too, may be swept out of the atmosphere by rain water.

The following values may be of general significance in appraising free ammonia content: Low 0.015 to 0.03 ppm; moderate 0.03 to 0.10 ppm; high 0.10 or greater.

Total Kjeldahl is a measure of the total nitrogenous matter present except that measured as nitrite and nitrate nitrogens. Total Kjeldahl less the Ammonia Nitrogen measures the organic nitrogen present. Ammonia and organic nitrogen determinations are important in determining the availability of nitrogen for biological utilization. The normal range for Total Kjeldahl would be 0.1 to 0.5 ppm.

Nitrite Nitrogen

Nitrite is usually an intermediate oxidation of ammonia. The significance of nitrites, therefore, varies with their amount, sources, and relation to other constituents of the sample, notably the relative magnitude of ammonia and nitrite present. Since nitrite is rapidly and easily converted to nitrate, its presence in concentrations greater than a few thousandths of a part per million is generally indicative of active biological processes in the water.

Nitrate Nitrogen

Nitrate is the end product of aerobic decomposition of nitrogenous matter, and its presence carries this significance. Nitrate concentration is of particular interest in relation to the other forms of nitrogen that may be present in the sample. Nitrates occur in the crust of the earth in many places and are a source of its fertility.

The following ranges in concentration may be used as a guide: low less than 0.1 ppm; moderate 0.1 to 1.0 ppm, high greater than 1.0 ppm.

PHOSPHORUS

This element is commonly found in nature in the form of phosphates (PO_4). Raw or treated sewage, some industrial wastes, and agricultural drainage contain significant concentrations of phosphates. The laboratory provides two phosphorus determinations: total phosphorus and soluble phosphorus. Total phosphorus included orthophosphate, polyphosphate and organic phosphorus, while soluble phosphorus represents orthophosphates only.

Phosphorus is an essential nutrient for plant life and like nitrogen passes through cycles of decomposition and photosynthesis. Nitrogen and phosphorus are both essential for the growth of algae and limitation of these compounds controls their rate of growth.

Generally, soluble phosphorus in concentrations of 0.01 ppm or greater at the beginning of the growing season may cause algal nuisance conditions.

ANIONIC DETERGENTS AS ABS

The presence of anionic detergents as ABS is an indication that domestic waste is present.

PHENOLS

The presence of phenol or phenolic equivalents is generally associated with discharges containing petroleum products, or with wastes from some industries. It is generally conceded that adequate protection of surface waters will be provided if the concentration of phenols in waste discharges does not exceed 20 parts per billion (ppb). Phenolic type waste can cause objectionable conditions in water supplies and might taint the flesh of fish.

IRON

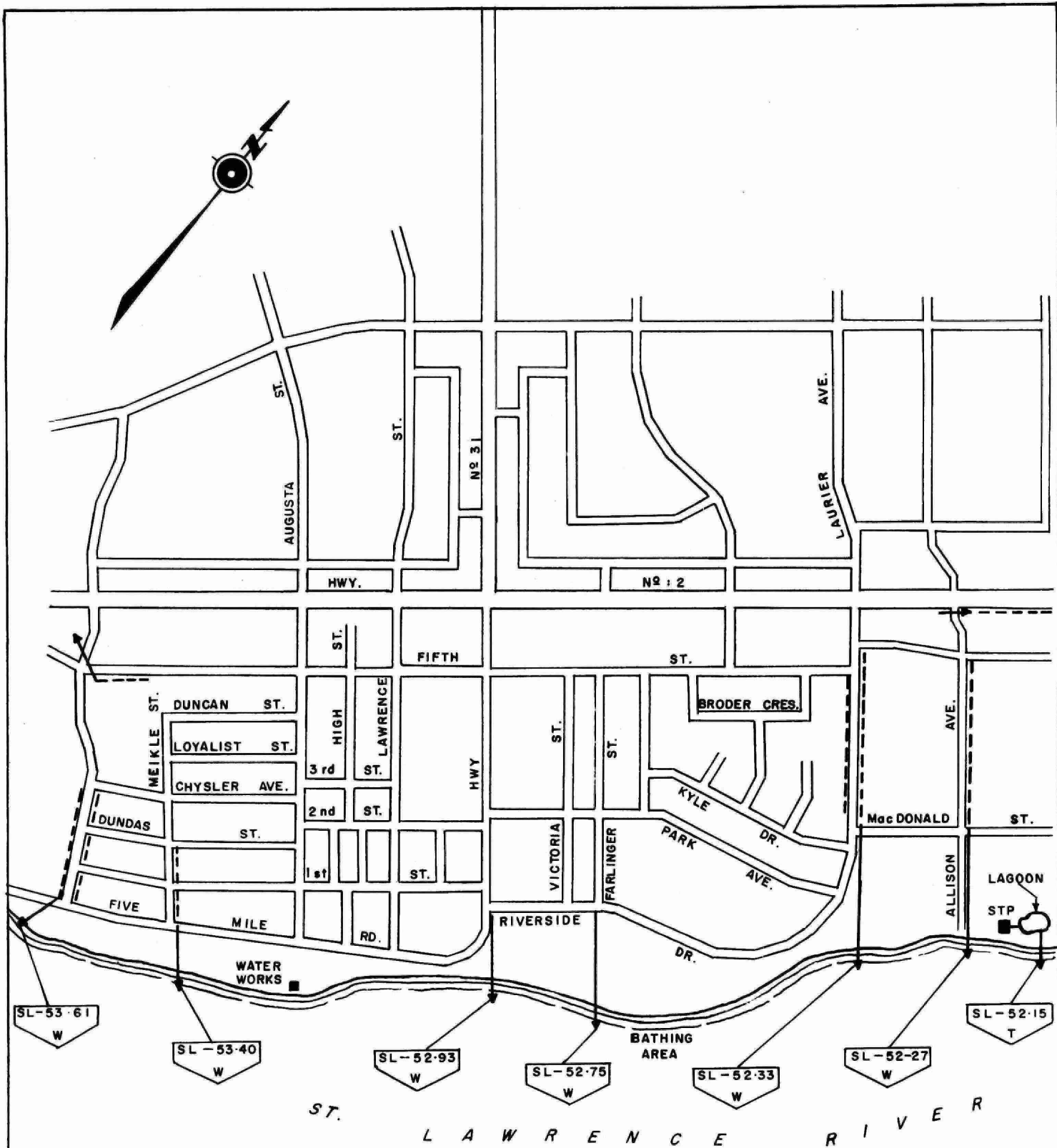
Water for domestic use should contain less than 0.3 parts per million of iron in order to avoid objectionable tastes, staining and sediment formation. Iron concentrations of not greater than 17 parts per million in waste discharges should permit adequate protection of surface waters.

APPENDIX III

VILLAGE OF MORRISBURG

BATHING AREA - BACTERIOLOGICAL SAMPLE RESULTS

<u>DATE</u>	<u>TOTAL COLIFORM ORGANISMS</u>	<u>FECAL COLIFORM ORGANISMS</u>
<u>1969</u>		
June 26	330	100
July 9	240	60
July 15	200	0
July 29	320	4
August 6	500	0
August 11	300	40
August 19	600	12
August 25	280	40
Geometric Mean Density -	326	12
<u>1970</u>		
June 2	50	8
June 2	125	6
June 18	175	50
June 18	165	32
July 3	80	14
July 13	195	44
August 11	6300	20
August 19	1400	350
August 19	2600	360
September 1	2500	200
September 1	2400	110
September 1	1700	90
Geometric Mean Density -	543	50
June 10	40	14
June 10	45	14
June 29	640	76
June 29	640	36
July 7	130	32
July 13	36	36
July 20	100	48
July 28	300	6
August 4	500	0
August 11	78	8
August 26	400	18
August 30	80+	12
Geometric Mean Density	149	16



LEGEND

- SL-53-61 — OUTFALL SHOWING STREAM AND MILEAGE
- W — TYPE OF OUTFALL
- W — STORM SEWER
- T — TREATMENT PLANT EFFLUENT

ONTARIO WATER RESOURCES COMMISSION

VILLAGE OF MORRISBURG WATER POLLUTION SURVEY 1972

SCALE: 1000 0 1000 FT.

DRAWN BY: L.L. BROOME DATE: MARCH, 1972

CHECKED BY: A. Mc. DRAWING NO: 72-24-DE



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